[No. 59]

SUBCOMMITTEE HEARING ON H. R. 7328, TO PROMOTE THE NATIONAL DEFENSE BY AUTHORIZING THE CONSTRUCTION OF AERONAUTICAL RESEARCH FACILITIES BY THE NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS NECESSARY TO THE EFFECTIVE PROSECUTION OF AERONAUTICAL RESEARCH; H. R. 5627, TO AMEND PUBLIC LAW 472, 81ST CONGRESS, APPROVED APRIL 11, 1950, ENTITLED "AN ACT TO PROMOTE THE NATIONAL DEFENSE AND TO CONTRIBUTE TO MORE EFFECTIVE AERONAUTICAL RESEARCH BY AUTHORIZING PROFESSIONAL PERSONNEL OF THE NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS TO ATTEND ACCREDITED GRADUATE SCHOOLS FOR RESEARCH AND STUDY"; AND H. R. 7541, TO PROMOTE THE NATIONAL DEFENSE BY INCLUDING A REPRESENTATIVE OF THE DEPARTMENT OF DEFENSE AS A MEMBER OF THE NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE NO. 1 OF THE
COMMITTEE ON ARMED SERVICES,
Washington, D. C., February 2, 1954.

The subcommittee met, the Honorable Paul W. Shafer, (chairman of the subcommittee) presiding.

Mr. SHAFER. The committee will come to order.

We have three bills to consider relating to the National Advisory Committee for Aeronautics, all approved by the Bureau of the Budget. The first one is H. R. 7328, which is the fiscal year 1953 construction authorization for NACA.

(The bill referred to follows:)

[H. R. 7328, 83d Cong., 2d sess.]

A BILL To promote the national defense by authorizing the construction of aeronautical research facilities by the National Advisory Committee for Aeronautics necessary to the effective prosecution of aeronautical research

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That pursuant to subsection (b) of section 1 of Public Law 672, approved August 8, 1950 (50 U. S. C. 151b), the National Advisory Committee for Aeronautics is authorized to undertake additional construction, and to purchase and install additional equipment at the following locations:

Langley Aeronautical Laboratory, Hampton, Virginia: High-speed hydrodynamic facility, $1,220,000.

Ames Aeronautical Laboratory, Moffett Field, California: Alterations to two small supersonic tunnels, $349,000.

Lewis Flight Propulsion Laboratory, Cleveland, Ohio: Alterations to an existing supersonic tunnel, air dryer for propulsion systems laboratory, air heater for altitude test chambers, and rocket engine research facility, $3,431,000.

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SEC. 2. Any of the approximate costs enumerated in section 1 of this Act may, in the discretion of the Director of the National Advisory Committee for Aeronautics, be varied upwards 10 per centum and, with the concurrence of the Director of the Bureau of the Budget, by such further amounts as may be necessary to meet unusual cost variations, but the total cost of all work so enumerated shall not exceed $5,000,000.

SEC. 3. There are hereby authorized to be appropriated not to exceed $5,000,000 to accomplish the purposes of this Act.

Mr. SHAFER. The witnesses are present.

Mr. Hugh L. Dryden, Director of NACA, you may proceed.

Mr. DRYDEN. May I make a brief statement, Mr. Chairman?

In our facilities program we operate under the general authority of Public Law 672, which was passed in 1950, and under specific authorization bills from year to year.

The items which are in the bill before you have been discussed at our hearing with the Appropriations Committee, but the Appropriations Committee has made it clear that these items will not be included in the appropriations bill until they have been approved by this committee.

I may recall to some of you that NACA did not have specific authorization for items similar to those in this bill, until comparatively recently. Since then by agreement between the Armed Services Committee and the Appropriations Committee we have presented these items to both committees, at the beginning of the session, with the understanding that they will be cleared through the legislative committee before the appropriation is approved.

Mr. SHAFER. That is the way we like to have them.

Mr. DRYDEN. I would like to explain very briefly the details of the facilities. The first one is a, what we call a hydrodynamic facility at the Langley Labroatory.

You may have seen in the press pictures of a new type of airplane which lands on the water on skis. This development is a very promising one. I don't think I need to expand further on the military value of being able to operate from the surface of the water.

This facility is a concrete towing basin adjacent to an existing landing loads track and the purpose is to utilize the track which already exists to operate a high speed carriage for research on the landing and taking off characteristics of high speed water-based aircraft.

I might recall to your mind that naval aircraft and water-vased aircraft are now able to approach the performance of land-based aircraft.

Mr. KELLEHER. This includes jets too, of course, Doctor?

Mr. DRYDEN. Yes.

Mr. HESS. Just a second, off the record.

(Discussion off the record.)

Mr. SHAFER. Proceed.

Mr. DRYDEN. I mentioned that airplane because pictures of it have appeared widely in the press so that it is very well known.

This facility includes observation stations, a model preparation shop, offices, and necessary alterations to the existing landing loads track are included. Recent developments in design and handling techniques have shown the possibility of constructing water-based aircraft having performance comparable to that of advanced types of land-based aircraft. Present hydrodynamic research facilities are

limited to speeds up to 60 miles per hour, while the needs for design data range up to 150 miles per hour. The most expeditious method for obtaining the necessary new facility is to utilize the equipment of the landing loads track or propelling and arresting the model, and to build a new towing tank and auxiliary apparatus adjacent to the track. This will make possible the production of design data for the maximum utilization of new principles in the development of water-based military aircraft.

The estimated cost of this facility is $1,220,000.

Now sir, do you wish to proceed with the other items or discuss them 1 by 1?

Mr. SHAFER. We will discuss them 1 by 1.

Mr. KELLEHER. Doctor, this is for $1,220,000. As I visualize it it is a concrete tank that will be constructed along side an existing track which you have been using for similar testing purposes, but not on water.

Mr. DRYDEN. That is right.

Mr. KELLEHER. I notice that among the items that will be constructed for this million point two dollars, that there will be a model preparation shop and some offices in addition to the tank itself.

Mr. DRYDEN. Yes.

Mr. KELLEHER. It has occurred to me that at Langley, it being an installation that has been in existence for sometime, you would already have in existence some of these "overhead" facilities.

Could you not construct just the tank and the instrumentation that goes with it and use your existing office space and model shops and so on without constructing new ones for this facility?

Mr. DRYDEN. First may I say that the model preparation shop may convey a wrong idea. This is not a place, shop where models are constructed or built. It is a place where you keep the models, put the instruments in, just before the test.

Now, the explanation is a geographical one. This tract is approximately a half mile long, it is located about 1½ miles from the nearest structures. It is necessary to have some kind of facilities in the nature of working space and offices to carry on the work.

Mr. KELLEHER. I note you said this is the "most expeditious" method of obtaining this new facility. Is it, everything considered, also the least expensive?

Mr. DRYDEN. Yes. We made rather extended studies of other methods. I think many of you are familiar with the ordinary type of towing tank, a long tank with a rail on each side and a carriage which runs along, we made some studies of the possibility of getting speeds of 150 miles per hour with that type of facility.

The problem is of course that you must allow a certain space to get up to speed, certain range for measurements, then you have to stop this carriage. These design studies showed that to build a tank for 150 miles an hour required, would require the expenditure of many millions of dollars.

This is a clever device of using a track which already exists and with the addition of a small tank alongside of it, of being able to utilize the track and carriage, not the carriage but the arresting gear and the propelling devices for two purposes, one for the present studies of landing gears, the other for operating this tank alongside of it.

So it really represents a very economical way of obtaining data at 150 miles per hour on a water surface.

Mr. KELLEHER. Will you continue, please?

Mr. DRYDEN. The next two items are at the Ames Aeronautical Laboratory at Moffett Field in California. They represent alterations in equipment, existing equipment, to increase its ability to handle the current problems.

The first one is alterations to a supersonic free-flight tunnel, $196,000. Proposed to construct a new test section for this facility, increasing its length by 9 feet and increasing the number of shadowgraph stations from 7 to 18. Research data on drag, lift, pitching moment, damping in roll, aileron effectiveness, boundary-layer transition, and skin friction is required in the development of aircraft and missiles designed to operate at very high Mach numbers. The present tunnel is adequate for the accurate measurement of drag, but has been found to be inadequate for other measurements. The proposed alterations will remedy this defect.

I might supplement this statement by saying that this is an unusual piece of equipment in which a wind tunnel having a speed of about twice the speed of sound is used together with a gun which fires a model upstream against the air current in the wind tunnel with the result of being able to obtain the equivalent of very high relative speeds of the model and the air.

The second item is again an alteration to the 10- by 14-inch supersonic tunnel at a cost of $153,000. The purpose of this project is to increase the Reynolds number range of the tunnel by about 200 percent. An existing compressor in the adjacent 10- by 10-inch heat transfer tunnel can be utilized by installing appropriate piping and control equipment, and making some structural alterations. The modified facility will then be capable of determining altitude effects on the aerodynamic characteristics of modern high-speed missiles.

These two items are of a type, general type on which you may expect to hear from us from year to year. As many of you know we have a plant with a total value of more than $250 million.

It is highly—it consists of highly complex mechanical equipment and it is necessary to make changes from time to time to meet our needs.

Mr. KELLEHER. What is the Reynolds number range?

Mr. DRYDEN. The Reynolds number is a combination of speed and size of model—translated into the language of the layman meaning—higher Reynolds numbers give you results that are more closely like those on an actual scale airplane.

Mr. KELLEHER. You will come closer to it.

Mr. DRYDEN. Come closer to it, yes.

The next items are at the Lewis Flight Propulsion Laboratory in Cleveland, 8- by-6 foot supersonic tunnel alterations, $120,000: The alterations contemplated under this project consist of changing the upstream connections of the flexible nozzle plates of the test section to permit operation of the tunnel at lower supersonic speeds. The present tunnel speed range, while adequate for presently contemplated combat-design speeds, does not permit evaluation of promising designs in the critical low supersonic speed range. The modifications will allow the necessary research data to be obtained quickly and economically.

Contrary to most of our requests to increase the speed of our facilities, this is a request to decrease the speed.

This comes about because when the—this tunnel was designed and built—we knew only how to design for a limited range of Mach number and the tunnel was designed for 1.4 times the speed of sound to 2 times the speed of sound.

Here again the engineers working with the tunnel have proposed a relatively simple and relatively inexpensive modification which will permit the lower end of the speed range to be pushed down.

The second item is an air dryer for the propulsion system laboratory, $458,000: the addition of a third air-drying tower and associated refrigeration equipment is proposed under this project. This will make possible the use of the free-jet technique, which requires dry air, in ram and turbojet engine investigations to obtain reliable inlet and engine matching data.

This request grows out of our experience in testing the motor for a missile project which I do not want to identify. We have found that to cover the range of altitude and speeds that are necessary for testing of specially ram jet engines it is desirable to have more air-dryer capacity, in fact it is necessary, if we are to cover the sider range of altitude and Mach number.

The air heater is for the altitude test chambers of $302,000: the proposed project includes the installation of the necessary equipment to heat the combustion air used in two altitude test chambers in the engine research building. In order to simulate flight conditions at high altitude and supersonic speeds for turbojet engine investigations, inlet air must be provided at elevated temperatures. The installation of the equipment covered by this project is the most economical means of accomplishing this purpose.

Here again to give you a little of the background, I think through the reports in the press you are familiar with the fact that from 1947 to 1953, the speed of research airplanes has increased from the speed of sound by Yeager in 1947 to nearly one and one-half times the speed of sound also by Yeager in 1953.

Also you know from the daily press that we are beginning to produce our first tactical supersonic airplane—whose speed again is a restricted matter.

The purpose of this equipment is to be able to reproduce the entry air conditions on higher speed aircraft in our existing equipment.

The final item is rocket engine research facility for $2,551,000: this proposed new facility includes a test structure with apparatus for the removal and disposal of products of combustion from the rocket exhaust, appropriate instrumentation, fuel storage pits and tanks, a central building containing a shop, instrument center, and offices for the research staff, and necessary utilities. High-energy propellants will be investigated in rocket engines of medium thrust. In the design of rocket-powered vehicles for the military services, many practical problems associated with rocket motor size have been encountered. These problems can only be attacked and solved by conducting research in a facility of this type where motors covering a range of thrust levels and periods of operation can be investigated.

Mr. KELLEHER. This is a new facility?

Mr. DRYDEN. Yes, this is a new facility. I would like to describe our relation to the general problem of development of rocket engines

because I am sure you have all heard of very large facilities at Edwards Air Force Base, and the very large facilities of the North American Aircraft Co., in which rocket motors certainly of the size of the V–2 motor and larger can be tested.

We have at the present time an activity on studying rocket fuels, rocket-cooling problems done on the relatively small scale with rockets of the order of a few hundred pounds thrust. There is great promise either in extending the range of rocket missiles or in reducing the weight of the missiles to give a certain performance, in the use of special fuels. Again in an unclassified session I do not wish to describe these fuels in detail.

Now, the part of the NACA in this teamwork of keeping us ahead in rocket engines is to do the necessary research on rocket fuels, rocket cooling, rocket-combustion problems, at a size which is large enough that the development agencies can take over, the people who design the actual military weapons, and this facility enables us to carry out part of the responsibility.

I have checked very carefully with the military services and have discussed this problem with the budget bureau, such facilities are very directly related to our military plans for the development of missiles.

If certain military projects are to go ahead, and we have been told that they are going ahead, then we need to have this facility in order to hold up our part of the responsibility.

Mr. HESS. The military is asking for this and the Bureau of the Budget has no objection?

Mr. DRYDEN. That is correct.

Mr. KELLEHER. Would you describe, Doctor, your relationship to the military. I understand at one time you used to do research on a contract basis for civilian airlines, and so forth.

Mr. DRYDEN. No. Our rules do permit occasional testing for civilian agencies but in practice the military problems over the past years have increased in importance. Now there is coming in to operation the so-called unitary facilities which were specifically for the purpose of development work of very high-speed aircraft and missiles.

Mr. SHAFER. Doctor, I dislike very much to interrupt you, but we have a quorum call, and we will go over and answer the quorum, if you don't mind, and return.

Mr. DRYDEN. We will wait until you come back, sir.

Mr. SHAFER. Thank you very much.

(Recess taken.)

Mr. SHAFER. Come to order, please.

You may proceed, Doctor.

Mr. DRYDEN. I think we were discussing the relations of NACA to the Department of Defense.

The task that was assigned to the NACA back in 1915 was the development of aeronautical research which would form the basis on which the industry could design improved aircraft. I don't think you want me to go into an extended history——

Mr. SHAFER. No; I don't think it is necessary.

Mr. DRYDEN. Many of you are familiar with it.

Mr. KELLEHER. Mr. Chairman, there has been an effort during the last several years to keep the NACA construction bill consistent with the military construction authorizations.

Mr. SHAFER. Section 2.

Mr. KELLEHER. Yes; section 2. In the interest of continuing that effort I would suggest an amendment as follows:

On page 2, and within section 2, on line 11, strike "10 per centum" and insert "5 per centum".

Strike the remainder of the line 11 and all of line 12, and the following language in line 13: "amounts as may be necessary".

That will make this bill, as a construction bill, consistent with the most recent military construction authorization.

Mr. DRYDEN. That is entirely acceptable, Mr. Chairman.

Mr. SHAFER. Very well.

Are there any questions?

Mr. DOYLE. No, sir.

Mr. HESS. No, sir.

Mr. SHAFER. I will entertain a motion to report it as amended to the full committee.

Mr. HESS. I so move.

Mr. DOYLE. I second the motion.

Mr. SHAFER. It has been moved and seconded.

Without objection, it will be reported to the full committee as amended.

(Whereupon the committee proceeded to further business.)

H. R. 5627

Mr. SHAFER. The next bill is 5627, a bill which would amend existing law so as to permit the NACA to spend $100,000 a year for the payment of salaries to employers while on leave at universities for graduate study and research in science and engineering.

The current law, Public Law 472, 81st Congress, places a limitation of $50,000 as the amount which may be spent for these purposes in any fiscal year.

(The bill referred to is as follows:)

[H. R. 5627, 83d Cong., 1st sess.]

A BILL To amend Public Law 472, Eighty-first Congress, approved April 11, 1950, entitled "An Act to promote the national defense and to contribute to more effective aeronautical research by authorizing professional personnel of the National Advisory Committee for Aeronautics to attend accredited graduate schools for research and study."

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section 6 of Public Law 474, Eighty-first Congress, is amended to read "The total of the sums expended pursuant to this Act, including all sums expended for the payment of salaries or compensation to employees on leave, shall not exceed $100,000 in any fiscal year.".

Mr. DRYDEN. The NACA, Mr. Chairman, has had approximately 4 years' experience operating under Public Law 472 since its approval on April 11, 1950.

Under the present limitation of $50,000 per year we have been able in approximately 4 years to grant leave for university graduate study and research in science to 341 professional employees representing a total of 28 man-years of leave. Most of the grants were for cumulative periods of a few weeks each, some for longer periods and in half of the cases the employees supplemented their official leave with leave without pay for 50 percent of the period. We have found this specialized graduate study to be of notable value in advancing our research work and in economically developing additional knowledge

and skill of our scientists. On the basis of this experience, we find that it would be in the public interest to extend this program.

Public Law 472 provides that the employee shall pay his own tuition and other academic expenses. The interest of the Government is protected by the provision requiring that the employee return to the NACA for a period of 6 months if the leave of absence does not exceed 12 weeks, or for a period of 1 year if the period of leave exceeds 12 weeks, or reimburse the Government for the leave granted if the commitment is not fulfilled. There have been no losses to the Government under this NACA program. Leaves of absence are granted under this authority only in those cases where the special course of study to be undertaken by the employee would qualify him for more effective work with the NACA.

This proposed legislation is noncontroversial, is in the public interest, and will provide for granting of additional leaves of absence without expense to the Government for tuition, travel, subsistence, or academic expenses, and will not require any increase in NACA appropriations.

I might say, Mr. Chairman, that we have placed great emphasis on the man himself making some contribution because he gets some incidental benefit.

In general the type of courses that most of these cases cover may be illustrated by a special course given at MIT in the summer on guided-missiles control, and so forth. This gives a chance to get a few people up with the latest thinking in that field.

Mr. SHAFER. I think you have done a very commendable job. I don't believe that such an increase is exhorbitant. You have apparently used your money very well.

Mr. DRYDEN. Thank you.

Mr. SHAFER. Are there any questions?

Mr. KELLEHER?

Mr. KELLEHER. No, sir. I think the doctor mentioned that this will not increase their appropriation.

Mr. DRYDEN. Yes.

Mr. HESS. I move that it be favorably recommended to the full committee.

Mr. DOYLE. I second the motion.

Mr. SHAFER. Without objection it will be reported to the full committee.

(Whereupon the committee proceeded to further business.)

H. R. 7541

Mr. SHAFER. The next bill is H. R. 7541. This bill is merely corrective. Existing law designates "The Chairman of the Research and Development Board of the Department of Defense" as one of the 17 members of the NACA appointed by the President.

Reorganization Plan No. 6 transferred the functions of the Research and Development Board to the Secretary of Defense and abolished the office of the Chairman of that Board. This bill will correct the existing situation by providing for "One representative of the Department of Defense from the office in charge of Research and Development" to be one of the 17 members.

(The bill referred to follows:)

[H. R. 7541, 83d Cong., 2d sess.]

A BILL To promote the national defense by including a representative of the Department of Defense as a member of the National Advisory Committee for Aeronautics

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That Public Law 271, Sixty-third Congress, approved March 3, 1915 (38 Stat. 930; 50 U. S. C. 151a), as amended, be amended by striking out "the chairman of the Research and Development Board of the Department of Defense" and inserting in lieu thereof "one representative of the Department of Defense, from the office in charge of research and development".

Mr. SHAFER. Do you have anything you wish to add, Dr. Dryden?

Mr. DRYDEN. I have no further comment to make on that.

Mr. SHAFER. It is very clear as to what the bill will do.

Do I hear a motion to report it?

Mr. HESS. I so move.

Mr. DOYLE. I second the motion.

Mr. SHAFER. Without objection it will be reported to the full committee.

Thank you, gentlemen.

(Whereupon, the committee adjourned.)

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